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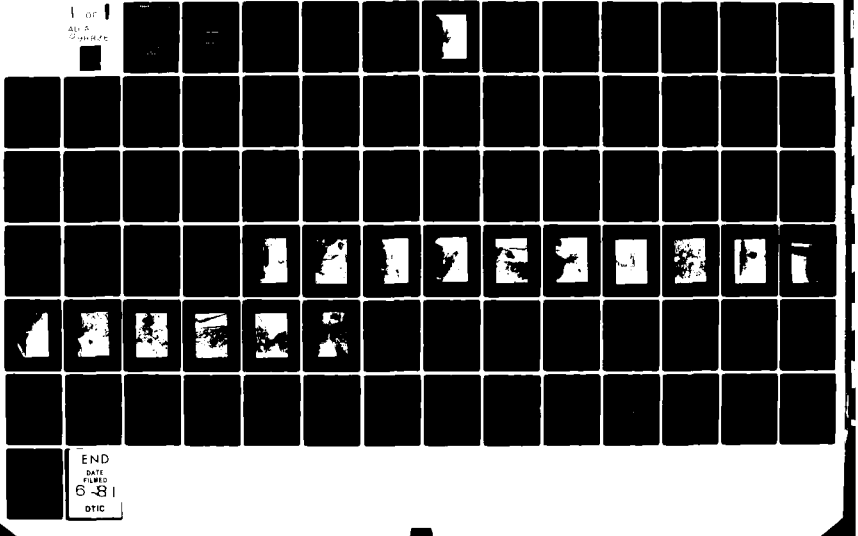

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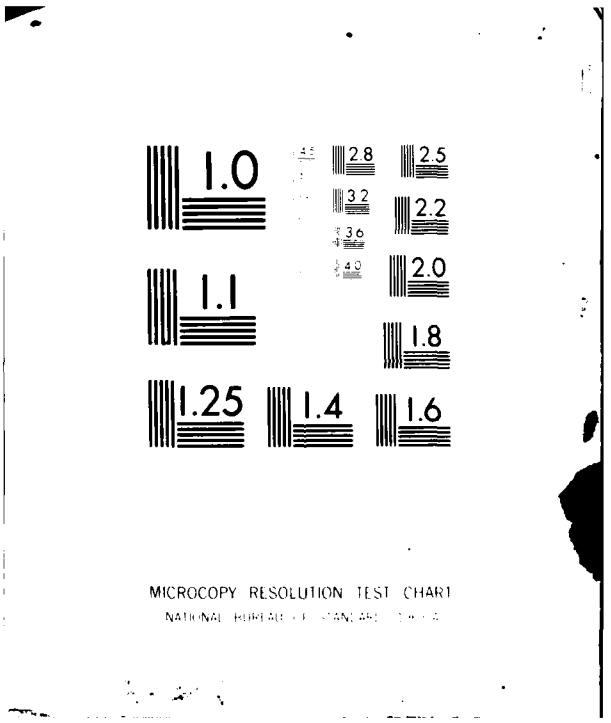
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LEVEL II

DELAWARE RIVER BASIN,
TRIBUTARY TO BEAVER RUN, CHESTER COUNTY,
PENNSYLVANIA
NDI NO. PA.00967
DER NO. 15-273

RODEBAUGH DAM

OWNER: RODEBAUGH

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

prepared by

Woodward-Clyde Consultants

DACW 31-8 1-C-

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

MARCH 1981

(1)

DELAWARE RIVER BASIN

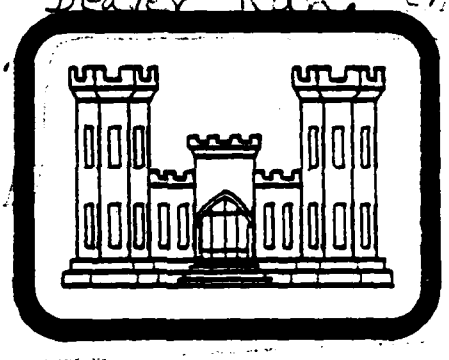
TRIBUTARY TO BEAVER RUN

RODEBAUGH DAM
CHESTER COUNTY, PENNSYLVANIA

NDI NO. PA 00967
DER NO. 15-273

(6) PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.

Rodebaugh Dam (NDI number PA 00967 DER Number 15-273) Delaware River Basin, Tributary To Beaver Run, Chester County, Pennsylvania. Phase I Inspection Report.



(15) DAC[illegible]

Prepared by:

WOODWARD-CLYDE CONSULTANTS
5120 Butler Pike
Plymouth Meeting, Pennsylvania 19462

(12) 73

Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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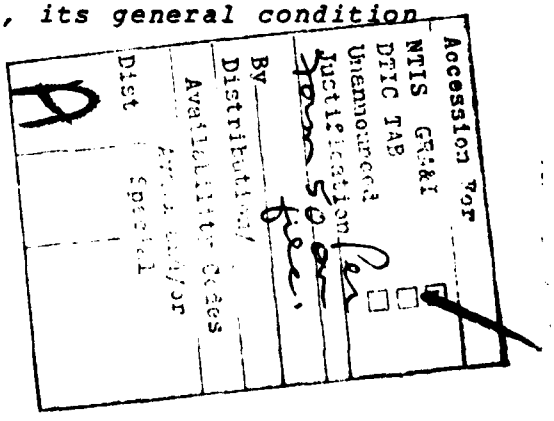
PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the size and hazard classifications. The selected spillway design flood can range from the 100 Year Flood to the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff). The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Rodebaugh Dam
County Located:	Chester County
State Located:	Pennsylvania
Stream:	Tributary to Beaver Run
Coordinates:	Latitude 40° 9.1'
	Longitude 75° 40.9'
Date of Inspection:	December 1, 1980

Rodebaugh Dam is a privately owned dam used for recreational purposes. The dam is in fair condition and the spillway is in poor condition requiring repairs.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "Significant" hazard classification is the 100 Year Flood to one-half the Probable Maximum Flood. Based on the small capacity of the reservoir and the limited downstream development the 100 Year Event has been selected as the spillway design flood.

Hydrologic and hydraulic computations presented in Appendix D indicate that the spillway structure is not capable of discharging the 100 Year Event without overtopping the embankment by about one-half foot for more than 1.0 hour. The structure is considered to have an "Inadequate" spillway as it will not pass the spillway design flood without overtopping the embankment. If the embankment crest were raised to its design elevation, the spillway would be considered "Adequate".

It is recommended that the following measures be undertaken immediately. Items (1) through (4) should be performed under the supervision of a registered professional engineer experienced in the design and construction of dams.

(1) The cause of the apparent fresh soil displacement adjacent to the left spillway wall should be investigated.

(2) The spillway capacity of the structure should be increased to meet the current hydrologic/hydraulic criteria. Spillway capacity can be increased by raising the embankment crest to the height of the spillway walls.

(3) The spillway walls and the spillway discharge channel should be repaired. Dislodged stones of the spillway and channel should be replaced.

(4) All trees should be removed from the embankment and the embankment restored to its original condition.

(5) Seepage through the dam should be monitored for the development of turbidity and increase in quantity.

Because of the potential for property damage in the event of failure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented for this facility. This procedure should be coordinated with local authorities and should include a method of warning downstream residents that high flows are expected.

In addition, an operation and maintenance procedure should also be developed to insure that all pertinent items are carefully inspected on a regular basis and maintained in the best possible condition. This manual should contain procedures for maintaining the embankment grass cover.

Mary F. Beck — 3/19/81

Mary F. Beck, P.E.
Pennsylvania Registration 27447E
Woodward-Clyde Consultants

Date

John H. Frederick — 3/18/81

John H. Frederick, Jr., P.E.
Maryland Registration 7301
Woodward-Clyde Consultants

Date

APPROVED BY:

James W. Peck — 24 APR 81

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date

OVERVIEW
RODEBAUGH DAM, CHESTER COUNTY, PENNSYLVANIA

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

RODEBAUGH DAM
NATIONAL ID NO. PA 00967
DER NO. 15-273

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Rodebaugh Dam is an earthfill dam about 16 feet high and 235 feet long. The upstream slope above the water line averages about 2H:1V and is protected by riprap. The embankment crest is about six feet wide and protected by grass. Construction specifications indicate a stone masonry core wall under the dam centerline with a minimum base thickness of 3 feet, tapering to one-foot thick at the top. The downstream slope ranges from about 2.0H:1V to 3.2H:1V and is covered with grass and weeds.

A 20-foot wide stone masonry spillway is constructed near the right abutment. The stone masonry spillway walls reportedly are five feet thick at the base and 2.5 feet thick at the top. A foot bridge rests on top of the spillway walls, Photograph 1. Water discharges over a concrete weir down a series of four steps to a shallow pool, see Photograph 11. Water flows about 40 feet through a paved discharge channel before entering the downstream channel.

The pond drain is a 16-inch corrugated metal pipe encased in concrete located about 16 feet to the left of the spillway. Flow through the pond drain is controlled by a valve located approximately half way between the upstream toe and the dam centerline.

b. Location. The dam is located across a tributary to Beaver Run in East Nantmeal Township, Chester County, Pennsyl-

vania. The dam site is about 1.8 miles south-southeast of the intersection of Pennsylvania Routes 23 and 100. The site is shown on the USGS Quadrangle map entitled "Pottstown, Pennsylvania at Coordinates N 40° 9.1' W 75° 40.9'. A Regional Location Plan of Rodebaugh Dam is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as a "Small" size structure by virtue of its 16-foot height and less than 1,000 acre-foot reservoir capacity to the top of the dam.

d. Hazard Classification. A "Significant" hazard classification is assigned consistent with the potential for economic damage but few or no lives lost downstream on Beaver Run.

e. Ownership. The dam is owned by Mr. Everett G. Rodebaugh. All correspondence should be sent to Mr. Rodebaugh at R.D. #2, Pottstown, Pennsylvania 19464.

f. Purpose of the Dam. This dam is used for private recreational purposes.

g. Design and Construction History. In 1935, Mr. Rodebaugh requested advice from the Water and Power Resources Board as to the suitability of his site for a dam. In July 1935, a State Engineer examined test pits dug at the ends and center of the proposed dam. Examination disclosed the underlying formation for the right half of the dam to be a fairly impervious mixture of clay and small rocks. A loose rock formation through which there could be considerable leakage was disclosed under the left half of the dam and was deemed unsatisfactory to a depth of 10 feet.

A formal application to build a dam was submitted on June 22, 1936. The "Report upon the Application of Everett G. Rodebaugh" dated July 1, 1935, indicated that the dam would be an earth embankment, 270 feet long and 18 feet high with a spillway at the right abutment. A core trench 5.5 feet wide would be carried to solid rock along the centerline of the embankment. After the rock had been cleaned, all fissures would be grouted and the surface of the rock covered to a thickness of four inches with mortar. The spillway was designed to be 50 feet wide and 6 feet deep providing a discharge capacity of 2,570 cfs. The permit to build the dam was dated July 8, 1936.

Because of the higher than expected construction cost estimates for the proposed dam, alternate designs were investigated. On April 3, 1937, E. Rossi and Sons, Landscape Gardners and General Contractors, submitted a revised, smaller dam plan to the state for approval. In April 1937, the state approved the revised plan drawings. A revised embankment cross-section was not included with the new plans and it was understood that the original, approved cross-section would be used, i.e. up-and downstream slopes would be 2H:1V.

Construction started in May 1937. The state inspected the core trench excavation and found the satisfactory clay material in the right end of the trench and seamed rock in the left end. By early June, 90 percent of the core wall was completed and appeared to be satisfactory. The July state inspection indicated that the spillway walls were being built on too flat of a slope such that the dam would not have the design top width. The constructon superintendent said it would be corrected.

On July 20, 1937, Mr. Rodebaugh requested a final inspection by the state as the dam was complete. The dam completion report of August 2, 1937, indicated the reservoir had been filling for three weeks and, at the time of the completion inspection, the water level was 30 inches below the spillway crest and several small leaks appeared at the base of the spillway. The construction superintendent said that these would be sealed with concrete. The embankment crest was five feet wide instead of the design eight feet, but the crest elevation was higher by one foot than required. The riprap on the upstream face was noted to be about 2.5 feet below the design elevation. The spillway abutment retaining walls were 20 inches thick instead of 30 inches as shown on the plan and the left spillway wall was not plumb, leaning slightly towards the embankment. On August 31, 1937, the state requested that the spillway retaining walls be increased to the design thickness of 30 inches at top and 5 feet at the base. Review of the state's files indicated the other changes had been approved. In September, Mr. Rodebaugh requested permission to increase the spillway crest elevation by one foot. The state approved the request and also added that if the spillway walls were made as thick as planned and the upstream riprap placed, the dam would be approved. By November 15, repairs to the dam were completed. The spillway walls were made thicker and the leaks through the spillway corrected. The embankment crest width was increased to nine feet by placing earth on the upstream side and steepening the upstream slope to as much as 1.5H:1V. The riprap was placed to three feet above the spillway crest. Construction was satisfactory to the state. By February 1938 the spillway crest had been increased 18 inches and a revised drawing of the spillway section was submitted to the state. During an inspection in June 1938 slight seepage was observed through the spillway and the spillway discharge was entering cracks in the channel paving and emerging about 20 feet downstream from the spillway. By 1941, the channel paving below the spillway was disintegrated, requiring repair. The channel was repaired in 1951.

h. Normal Operating Procedures. Under normal conditions, all flow is discharged over the stone spillway. There are no minimum flow requirements downstream of this dam.

1.3 Pertinent Data.

A summary of pertinent data for Rodebaugh Dam is presented as follows.

a. Drainage Area (square miles)	0.58
b. Discharge at Dam Site (cfs)	
Maximum Known Flood (about 1950)	210
At Minimum Embankment Crest	454
c. Elevation (feet above MSL) (1)	
Top of Dam	
(existing)	388.6
(design)	389.5
Spillway Crest	385.0
Downstream Toe	372.4
d. Reservoir (feet)	
Length at Normal Pool	900
Length at Maximum Pool (est)	910
e. Storage (acre-feet)	
Normal Pool (est)	22
Top of Dam (est)	51
f. Reservoir Surface (acres)	
Normal Pool	6.1
g. Dam Data	
Type	Earth fill with stone masonry core wall
Length	235 feet
Side Slopes	
Upstream (above water line)	2H:1V
Downstream	2.3:1V to 3.2H:1V
Volume	3000 cu. yd.
Height (above downstream toe)	16.1
Crest Width	6 feet
Cutoff	Trench
Grout Curtain	None
h. Spillway	
Type	Stone and concrete weir
Elevation at Crest	385.0 feet
Length	20 feet

(1) Spillway crest elevation assumed to be 385 from USGS map. All other elevations are relative to this elevation.

i. Pond Drain

Type	16-inch CMP encased in concrete, control upstream of core wall
Length	75 feet
Inlet Invert Elevation	Unknown
Outlet Invert Elevation	373.1

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. Original engineering data for Rodebaugh Dam is limited to plans and specifications drawn by the Owner's engineer. Hydrologic/hydraulic data is limited to the State's required minimum spillway capacity and an evaluation by the State of the spillway capacity.

b. Design Features. Plan and profile views of the dam are shown on Plate 2, Appendix E. A Summary of the features of the dam is included in Section 1.3.

2.2 Construction.

The known construction history is presented in Section 1.2, paragraph g.

2.3 Operational Data.

There are no operational records maintained for this dam.

2.4 Evaluation.

a. Availability. All information presented herein was obtained from reports and correspondence from Pennsylvania Department of Environmental Resources files and supplemented by conversations with the Owner.

b. Adequacy. The available data are not adequate to evaluate the engineering aspects of this dam.

c. Validity. There is no reason to question the validity of the limited available data.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the check list enclosed herein as Appendix A and are summarized and evaluated in the following subsections. In general the appearance of the facilities indicate that the dam is currently in fair condition and is fairly well maintained and the spillway is in poor condition requiring maintenance.

b. Dam. The vertical alignment of the dam crest was checked and the profile is shown on Sheet 5B, Appendix A. There are no distortions in alignment that would be indicative of deep seated movement of the embankment or foundation although there are indications of surficial and/or shallow based movement of soils. Near the left spillway wall is a fresh transverse crack across the embankment crest about one-half inch wide. At the downstream edge of the embankment crest in the same location is a freshly disturbed area of soil removal and an area extending about six feet to the left of the spillway wall appears to have slumped, see Photograph 12 and Sheet 5A, Appendix A. About 40 feet left of the spillway and two feet below the downstream crest edge is a small scarp indicating downslope movement of soils or sod, see Photograph 9.

The upstream embankment slope above the water line ranges from 1.9H:1V to 2.2H:1V, typically about 2H:1V. The slope is protected by riprap which has been benched at the water line by wave and ice action. On the upstream embankment face near the left abutment is a 30-inch diameter tree. A large root from this tree crosses the dam crest about 30 feet to the right of the tree. A smaller, seven-inch tree is also growing on the upstream crest. There are three trees on the upstream embankment slope between the spillway and the right abutment. The crest ranges between five and six feet wide and is protected by grass. Areas of the crest are as much as 0.9 feet below design elevation. Both the upstream and downstream crest edges are slightly rounded. The downstream embankment slopes ranges from 3.2H:1V to 2.0H:1V, typically about 2.2H:1V. The downstream embankment slope is covered with grass with some light weeds. The grass appeared spotty with patches of moss and is judged to be in poor condition. There were no trees or large woody vegetation growing on the downstream embankment slope. All junctions between embankment and abutments appeared in good condition and no evidence of damage by foot traffic was noted either at the junctions or on the embankment itself.

Most of the seepage noted was beyond the toe of the embankment. The exception was a zone of seepage as shown on Sheet 5A, Appendix A on the downstream embankment near the left abutment. Standing water was noted in depressions beyond the embankment toe to the left of the spillway channel and at the pond drain outlet. Various seeps were noted at and beyond the toe of the embankment with two of these areas having flowing water. Seepage through the embankment was evidenced by water flowing through the spillway walls as described in the following subsection.

c. Appurtenant Structures. The stone and concrete spillway weir is in good condition. The spillway walls are constructed of stone rubble masonry and measure two and one-half feet thick at the top and are reportedly five feet thick at the base. Mortar is missing from both walls, both upstream and downstream of the weir in the vicinity of the water line. The left upstream spillway wall also has small stones missing around the water line and displays a crack, possibly evidence of settlement. A ruler could be inserted 15 inches into a crack between stones in the downstream right spillway wall near the stilling basin end sill, see Sheet 5A, Appendix A.

Pipes are protuding from the masonry walls immediately downstream of the weir and below the weir crest elevation. The left wall had three one-inch diameter pipes, two of which were discharging water. Another pipe was about one-half inch in diameter and about 12 inches long and when removed from the wall, was found to be packed with silt and sand at its upstream end. Water was flowing through the wall at an estimated 10 to 20 gpm, see Photograph 11. Four pipes are protruding from the right spillway wall, one of which had a hose coupling and was trickling water.

A one-foot deep stilling pool is located at the base of the stone weir steps. The sill end has a low flow notch and discharge is conveyed through a spillway channel, Photograph 1. The center of the channel is constructed of concrete while both sides are grouted rubble masonry. A few feet downstream of the end sill, particularly on the left side of the channel, the grout is broken and there are voids up to one foot deep under the paving. Downstream of the spillway walls the wasteway channel sides have been built up in an effort to contain the flow. Large spillway flows enter the broken paving and appear to exit into the area immediately to the left of the spillway and downstream of the dam, see Photographs 13 and 14 and Sheet 5B, Appendix A.

To the left of the spillway is the outlet of a 16-inch corrugated metal pipe encased in concrete, Photograph 2. The valve control box could be seen under water upstream of the dam crest. Design drawings indicated the intake structure to be at the upstream toe. No water was observed flowing through the pond drain although standing water was noted at its outlet.

d. Reservoir. The reservoir side slopes are generally gentle in the immediate vicinity of the reservoir and are well vegetated to the water's edge with grass. Immediately upstream of the reservoir is a low masonry dam. The water level of this upper reservoir is about three feet above the level of the main reservoir. Further upstream there are five more small ponds as shown on Plate 1, Appendix E.

e. Downstream Channel. The downstream channel flows for about 2,000 feet through a wooded narrow flood plain before joining Beaver Run. About 1500 feet further downstream is the first area subject to damage in the event of a dam failure. The residence shown in Photograph 16 is about three feet above the channel bottom. There are two other houses approximately six feet above the channel bottom. It is estimated that a sudden dam failure or failure occurring with flood flows in Beaver Creek would cause property damage with few or no lives expected to be lost. Therefore a significant hazard classification for this structure is indicated.

3.2 Evaluation.

In summary, the visual survey of the dam disclosed areas requiring further investigation or repairs. In general, seepage through the dam is assessed not to represent a serious condition. Seepage near the left abutment and beyond the downstream toe requires monitoring for development of turbidity or an increase in volume. The seepage through the left spillway wall may be related to the soil displacement noted adjacent to the wall, which requires investigation. Both the left and the right spillway walls are in poor condition and in need of fairly extensive repairs. The spillway channel below the end sill should be repaired to convey spillway discharges away from the dam.

The vegetative protection of the dam is in poor condition with patchy grass, areas of moss and trees on the upstream embankment face. Large tree roots are growing across the surface of the dam crest. It is probable that the root systems are extensive and extend through the dam. Large roots create voids in the embankment if the trees die. The large trees should be removed but not without considering long-term effects on the stability of the embankment.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Operation of the dam does not require a dam tender. All flow discharges over the spillway crest and flows downstream.

4.2 Maintenance of the Dam.

Maintenance is provided by the Owner on an as needed basis.

4.3 Maintenance of the Operating Facilities.

The only operational facility for this dam is the pond drain. It is unknown when it was last operated.

4.4. Warning Systems in Effect.

There are no formal warning systems or procedures to be followed during periods of exceedingly heavy rainfalls.

4.5 Evaluation.

It is judged that the current operating procedure which does not require a dam tender, is a realistic means of operating the relatively simple control features of Rodebaugh Dam.

There are no written operational or maintenance procedures or any type of warning systems. Maintenance and operating procedures should be developed, including a check list of items to be observed, operated and inspected on a regular basis.

Since a formal warning procedure does not exist, one should be developed and implemented during periods of extreme rainfall. This procedure should be coordinated with local emergency management officials and should consist of a method of notifying residents downstream that potentially high flows are imminent or dangerous conditions are developing.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design/Evaluation Data. Original design data is limited to the state's requirement that the spillway be designed to discharge not less than 500 cfs for the measured 0.7 (from 15 minute USGS map) square mile watershed. Calculations in the Department of Environmental Resources' files indicate that a spillway 20 feet wide and four feet deep would satisfy the requirement. Hydrologic and hydraulic evaluations made as a part of this investigation are contained in Appendix D.

The watershed is about 1.2 miles long and ranges from 0.3 to 0.7 miles wide having a total area of 0.58 square miles (measured from 7.5 minute USGS map). Elevations range from a high of 580 feet to the normal pool elevation of 385. The watershed is between 40 and 50 percent wooded with the rest predominantly open/farmland. Residential development is extremely limited within the watershed.

In accordance with the criteria established by Federal (OCE) guidelines, the recommended spillway design flood for this "Small" size dam and "Significant" hazard potential classification is the 100 Year Flood to one-half the Probable Maximum Flood. Because of the small capacity of the reservoir and the limited downstream development, the 100 year event has been selected as the spillway design flood.

b. Experience Data. No reservoir level records are maintained. The maximum known reservoir level is reported to be 26 inches above the spillway about 30 years ago corresponding to a peak spillway discharge of 210 cfs.

c. Visual Observations. On the date of the inspection, there were no conditions observed that might indicate a possible reduction in spillway capacity during an extreme event. Other observations regarding the condition of the downstream channel, spillway and reservoir are presented in Appendix A and are discussed in greater detail in Section 3.

d. Overtopping Potential. The overtopping potential of this dam was estimated using the HEC-1, Dam Safety Version, Computer Program. A brief description of the program is included in Appendix D. Calculations for this investigation indicate that the maximum spillway capacity under existing conditions is about 454 cfs. The spillway capacity would be increased to about 650 cfs if the embankment crest were raised to the same elevation as the spillway walls. The 100 year peak inflow rate was calculated by the computer program as about 710 cfs. This value was checked

against the peak inflow value as determined according to procedures contained in the Department of Environmental Resources Bulletin No. 13, "Floods in Pennsylvania". The computer program indicates that the 100 year event will overtop the embankment by about 0.5-foot for more than an hour under existing conditions. With the embankment crest raised to be equal to the spillway wall elevation, the spillway would be capable of discharging the 100 year event without overtopping the embankment.

e. Spillway Adequacy. The spillway for this structure is considered to be "Inadequate" as it will not pass a spillway design storm without overtopping the embankment.

f. Downstream Conditions. There is no development along the downstream channel between the dam and Beaver Run, a distance of approximately 2000 feet. The first structure subject to flooding in the event of high flows in Beaver Run is located about 3500 feet downstream of the dam on Beaver Run. The residence, Photograph 16, is located about 3 feet above the stream bed. There are two other nearby residences whose first floors are about 6 feet above the channel bottom. It is estimated that failure of Rodebaugh Dam, when combined with the flood flows in Beaver Run from its approximately three square mile watershed, would produce the maximum flood stage at the damage center and could cause significant damage to the residences but little or no chances for loss of life. Therefore, a "Significant" hazard potential classification is indicated.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Evidence of existing spillway instability as detected by visual observations included deterioration of mortar joints of the spillway walls and dislocation of some stones. The upstream embankment slope shows some effects of wave action over the years and large trees are growing on the upstream slope at the water line. Seepage was noted exiting just beyond the dam toe to the left of the spillway and also near the junction of the embankment and left abutment. State Dam Inspection Reports have noted seepage exiting the hillside and the toe since 1941. As no evidence of migration of fines through the embankment was noted, this seepage is assessed to represent a long-standing condition. Seepage through the spillway walls may represent a potential hazardous condition. Fresh soil displacement was noted adjacent to the left spillway wall, see Section 3. Seepage through the spillway wall may not represent a long-term stable condition and requires investigation.

b. Design and Construction Data. Design data is limited to drawings located in the Department of Environmental Resources' files. There are no stability analyses of the embankment in existence. The maximum height of the dam is about 16.1 feet above the downstream toe elevation. The upstream slope probably averages about 2H:1V and the downstream slope averages about 2.2H:1V. Based on the geometric configuration of the embankment and neglecting evidence of fresh soil displacement adjacent to the left spillway wall, the embankment is qualitatively assessed to be stable at this time.

Detrimental to the long-term stability of earthen embankments is the presence of extensive root systems within the embankments. Visual inspection disclosed the presence of large tree roots at the dam crest. Thus, it is considered probable that the root systems are fairly extensive. The long-term stability of the embankment could be adversely affected when these trees die and the roots rot, forming channels for water to percolate through the dam. If the trees are allowed to fall over, large craters could be formed possibly leading to a breach of the dam.

c. Operating Records. There are no operational records for this structure.

d. Post Construction Changes. Post construction modifications or changes are limited to the increase of the weir crest elevation by 18 inches shortly after the dam was completed. Other changes are limited to remedial repairs to the downstream spillway channel.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally, it can be considered that if a dam in this zone is stable under static loading conditions it can be assumed safe for any expected earthquake conditions. As the dam is qualitatively assessed to be stable at the present time under static loading conditions, it can reasonably be assumed to be stable under seismic loading conditions.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. Visual inspection indicates that Rodebaugh Dam is in fair condition and the spillway is in poor condition requiring repairs.

In accordance with criteria established by Federal (OCE) Guidelines the recommended spillway design flood for this "Small" size dam and "Significant" hazard classification is the 100 Year Flood to one-half the Probable Maximum Flood. Based on the small capacity of the reservoir and the limited downstream development, the 100 Year Event has been selected as the spillway design flood.

Hydrologic and hydraulic computations presented in Appendix D indicate that the spillway structure is not capable of discharging the 100 year event without overtopping the embankment by about 0.5 foot for over one hour. The structure is considered to have an "Inadequate" spillway as it will not pass the spillway design flood without overtopping the embankment. If the embankment crest were raised to design elevation, the spillway would be considered "Adequate".

b. Adequacy of Information. The combined visual inspection and simplified calculations presented in Appendix D were sufficient to indicate that further investigations are required for this structure.

c. Urgency. It is recommended that the measures presented in Section 7.2 be implemented as specified.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be taken immediately. Items (1) through (4) should be performed under the supervision of a registered Professional Engineer experienced in the design and construction of dams.

(1) The cause of the apparent fresh soil displacement adjacent to the left spillway wall should be investigated.

(2) The spillway capacity of the structure should be increased to meet the current hydrologic/hydraulic criteria. Spillway capacity can be increased by raising the embankment crest to the height of the spillway walls.

(3) The spillway walls and the spillway discharge channel should be repaired. Dislodged stones of the spillway and channel should be replaced.

(4) All trees should be removed from the embankment and the embankment restored to its original condition.

(5) Seepage through the dam should be monitored for the development of turbidity and increase in quantity.

b. Operation and Maintenance Procedures. Because of the potential for property damage in the event of a failure, a formal procedure of observations and warning during periods of high precipitation should be developed and implemented for this facility. This procedure should be coordinated with local authorities and should include a method of warning downstream residents that high flows are expected. In addition, an operation and maintenance procedure should also be developed to insure that all pertinent items are carefully inspected on a regular basis and maintained in the best possible condition. This manual should contain procedures for maintaining the embankment grass cover.

APPENDIX

A

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Rodebaugh Dam*

County *Chester* State *Pennsylvania*

NDI# *PA 00967* DER# *15-273* Type of Dam *Earth with masonry core wall*

Hazard Category *Significant*

Date(s) Inspection *Dec. 1, 1980*

Weather *Sunny* Temperature *50's*

Pool Elevation at Time of Inspection *385+-* M.S.L.

Tailwater at Time of Inspection *379.8±* M.S.L.

Inspection Personnel:

Mary F. Beck(Hydrologist) *Paul F. Marano (Geotechnical)*

Raymond S. Lambert (Geologist) *Vincent McKeever (Hydrologist)*

Richard E. Mabry (Geotechnical/Civil) *John H. Frederick, Jr., Principal*

Mary F. Beck Recorder

Remarks:

Mr. and Mrs. Rodebaugh were on site and provided assistance to inspection team.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/ EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

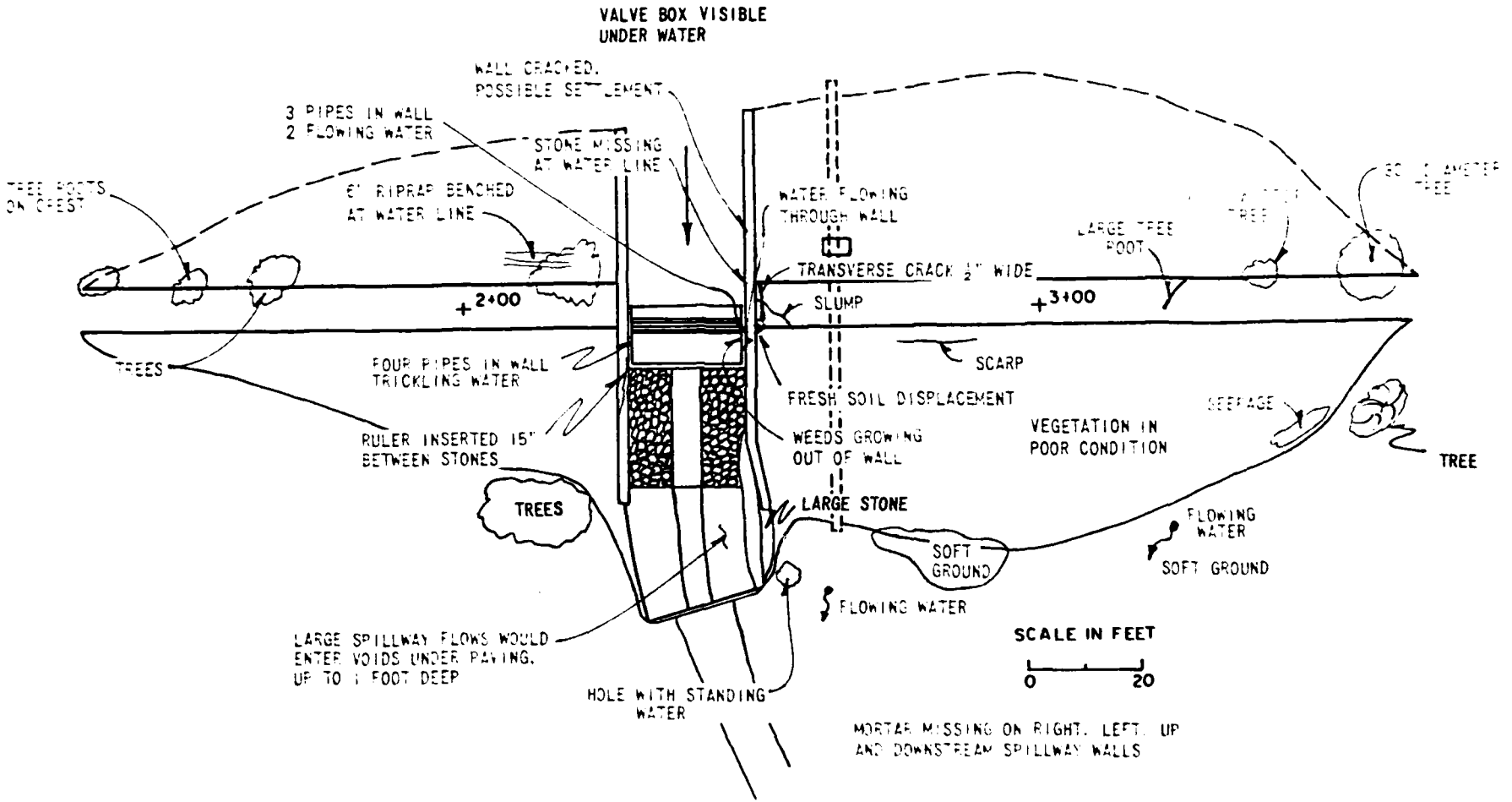
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*A transverse crack near left spillway wall, appears fresh, ends in small depression at downstream edge of crest.*
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None observed*
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*Appears to be a small amount of downslope movement of surficial material at maximum section as evidenced by a separation of vegetation clumps near crest.*
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*See sheets 5A and 5B*
RIPRAP FAILURES	*Upstream embankment at water line is benched, although riprap appears to be protecting embankment.*

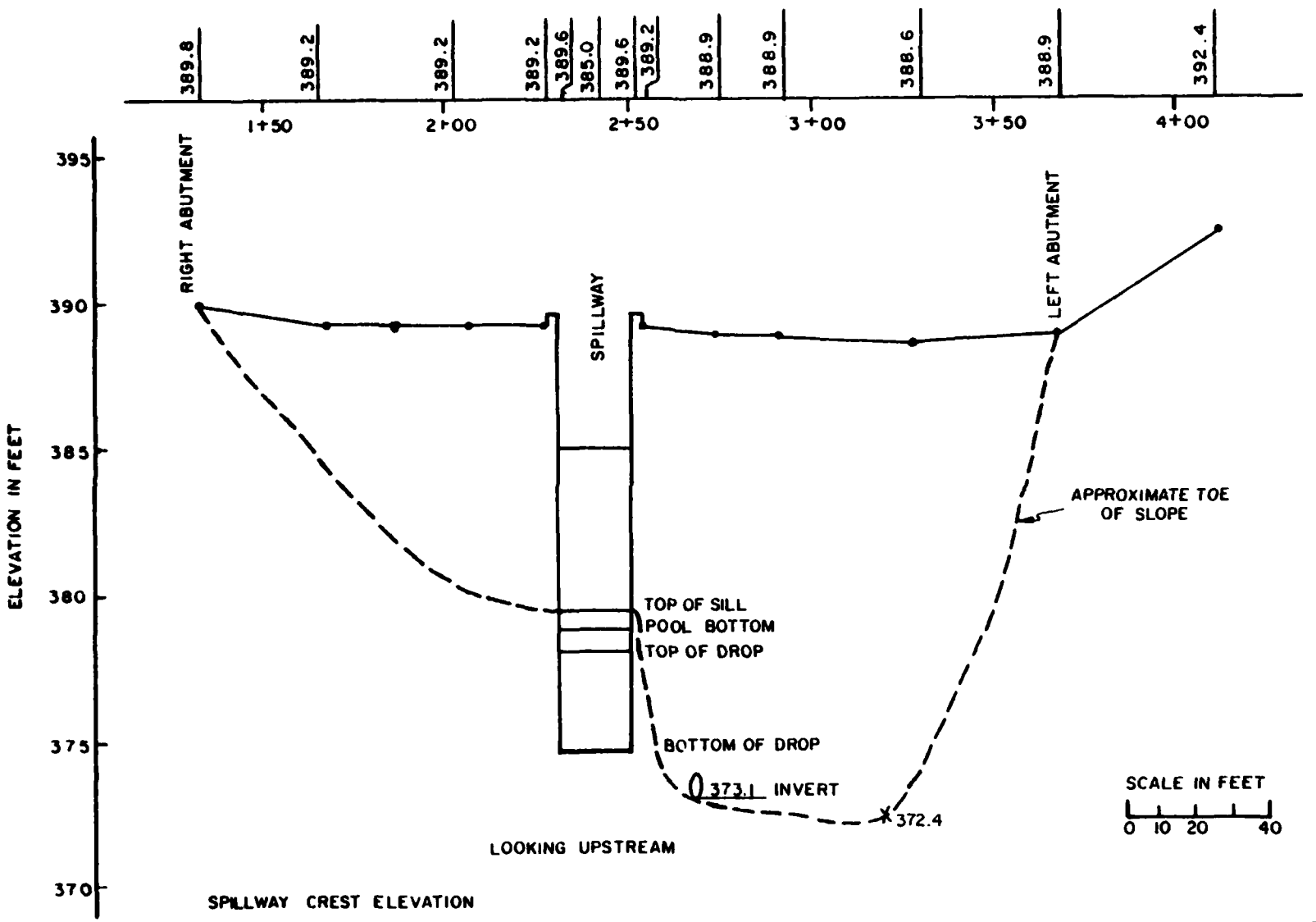
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
VEGETATION	*Vegetation on downstream embankment slope was dormant but appeared to be in poor to fair condition as evidenced by the "clumpy" root masses. Several large trees growing on upstream slope.*
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*Upstream and downstream junctions between embankment and abutments appear in good condition. Right junction between spillway and embankment in good condition. Erosion noted on Sheet 4 at junction of left spillway wall and embankment.*
ANY NOTICE-ABLE SEEPAGE	*Yes, see sheet 5A.*
STAFF GAGE AND RECORDER	*None*
DRAINS	*None observed*



FIELD OBSERVATION PLAN
RODEBAUGH DAM

SHEET 5 A OF 11



SPILLWAY CREST ELEVATION
ASSUMED 385.0 FROM USGS MAPS,
ALL OTHER ELEVATIONS RELATIVE

PROFILE ALONG CREST
RODEBAUGH DAM
SHEET 5B OF 11

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*N/A;conduit is 16 inch CMP encased in concrete*	
INTAKE STRUCTURE	*Intake underwater*	
OUTLET STRUCTURE	*None*	
OUTLET CHANNEL	*Small channel conveys discharge to spillway channel.*	
EMERGENCY GATE	*Located under water at upstream end, valve not operated. Valve has been operated, date unknown.*	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	*Appears in good condition. Concrete weir added to original masonry weir. Spillway walls are masonry. Left wall has 20-30 gpm seepage through wall which may account for depression noted on sheet 4*
APPROACH CHANNEL	*None*
DISCHARGE CHANNEL	*Spillway discharges into a grouted stone channel which is in poor condition. Normal (low) flow is contained in center of channel, Photograph 1 . Larger flows have washed soil from under stones creating voids, see sheet 5A.*
BRIDGE AND PIERS	*Foot bridge rests on spillway wall and has no piers*

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
TYPE	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/ SURVEYS	*None*	
OBSERVATION WELLS	*None*	
WEIRS	*None*	
PIEZOMETERS	*None*	
OTHER	*None*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
SLOPES	*Adjacent reservoir slopes are flat and grassed to waters edge. No debris noted along water line*
SEDIMENTATION	*Very little sediment. A series of six small dams at upper end would trap sediment before flow entered reservoir.*
WATERSHED	*About 60 percent wooded, with very limited residential development.*

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*The channel is about 4.5 feet wide with 2 foot high banks. The banks range from nearly vertical to 3H:1V.*
SLOPES	*The valley gradient is about 0.014.*
APPROXIMATE NO. OF HOMES AND POPULATION	*The stream flows about 2000 feet before entering Beaver Run. The houses shown (Plate 1, Appendix E) 500 feet downstream of the confluence appear high enough to escape damage in the event of a failure. About 1000 feet further downstream is one home about 3 feet above the channel bottom and the next two downstream houses are about 6 feet above the channel bank.*

APPENDIX

B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Rodebaugh Dam*

NDI NO. *PA 00967* DER NO. *15-273*

ITEM	REMARKS
AS-BUILT DRAWINGS	*None except 1938 spillway sketch and 1980 plan enclosed as Plates 4 and 3, Appendix E.*
REGIONAL VICINITY MAP	*See Plate 1, Appendix E.*
CONSTRUCTION HISTORY	*See Text, Section 1.2 Paragraph g*
TYPICAL SECTIONS OF DAM	*See Plate 4, Appendix E*
OUTLETS - PLAN	
DETAILS	*Appendix E*
CONSTRAINTS	
DISCHARGE RATINGS	*Appendix D*

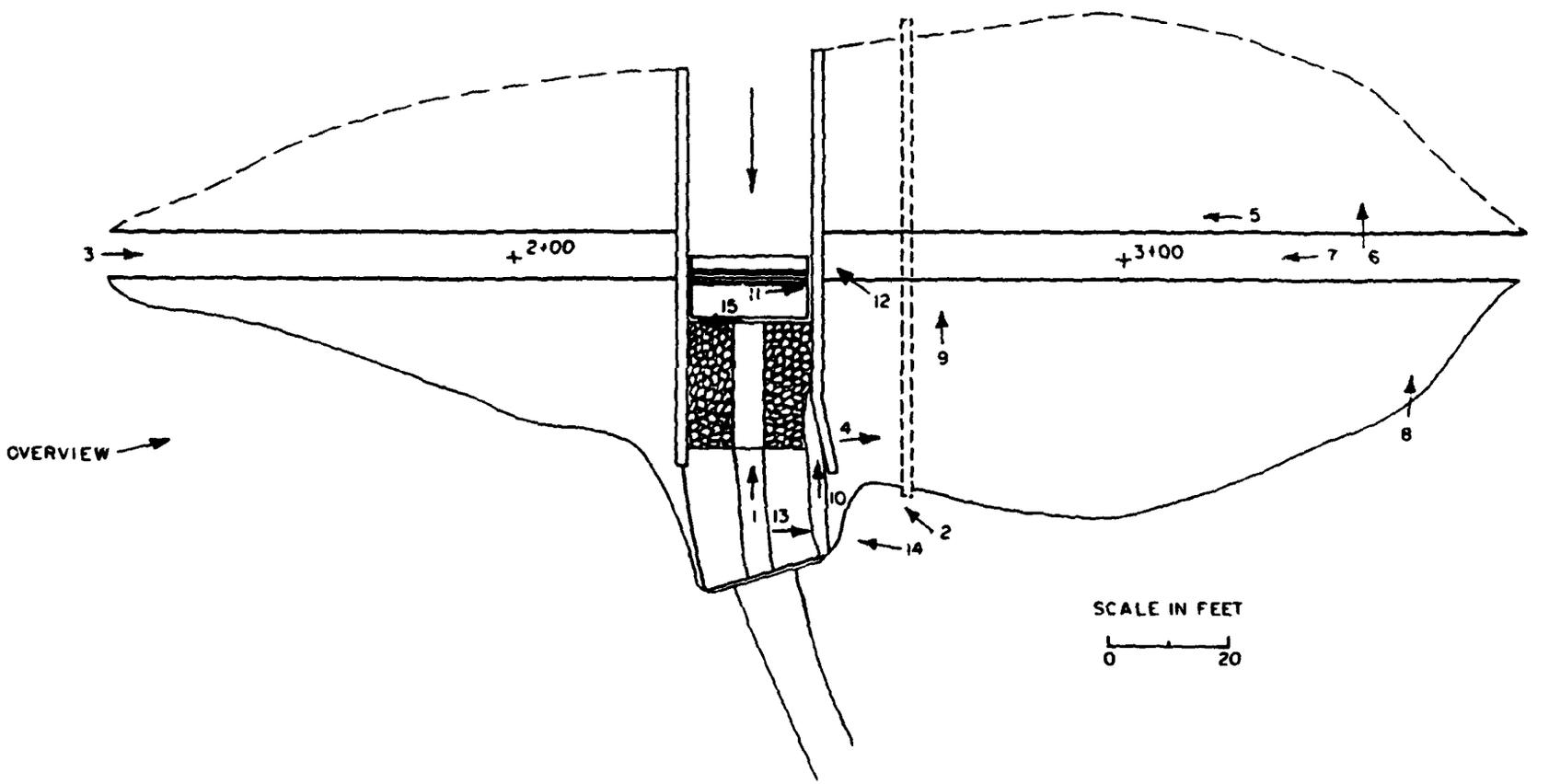
ITEM	REMARKS
RAINFALL/ RESERVOIR RECORDS	*None available*
DESIGN REPORTS	*None*
GEOLOGY REPORTS	*See Appendix F*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*None*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*None except test pits dug prior to construction*
POST CONSTRUCTION SURVEYS OF DAM	*None*

ITEM	REMARKS
BORROW SOURCES	*Adjacent to the site*
MONITORING SYSTEMS	*None*
MODIFICATIONS	*None*
HIGH POOL RECORDS	*None, the Owner reported a maximum depth over the spillway of 26 inches about 30 years ago.*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*Limited to state inspection reports.*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None*
MAINTENANCE OPERATION RECORDS	*None*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*Appendix E*
OPERATING EQUIPMENT PLANS AND DETAILS	*None available*
MISCELLANEOUS	*Information located in DER files.* *1. Report on the Application of Everett G. Rodebaugh, dated July 1, 1936, permit dated July 8, 1936.* *2. Construction plans, one hand sketched "as-built" drawing of the spillway.* *3. Construction Specification.* *4.. State construction inspection reports and memorandum to the file.* *5. Correspondence between DER and the Owner, Owner's Engineers and Contractors.* *6. DER dam inspection reports.* *7. 19 black and white photographs.*

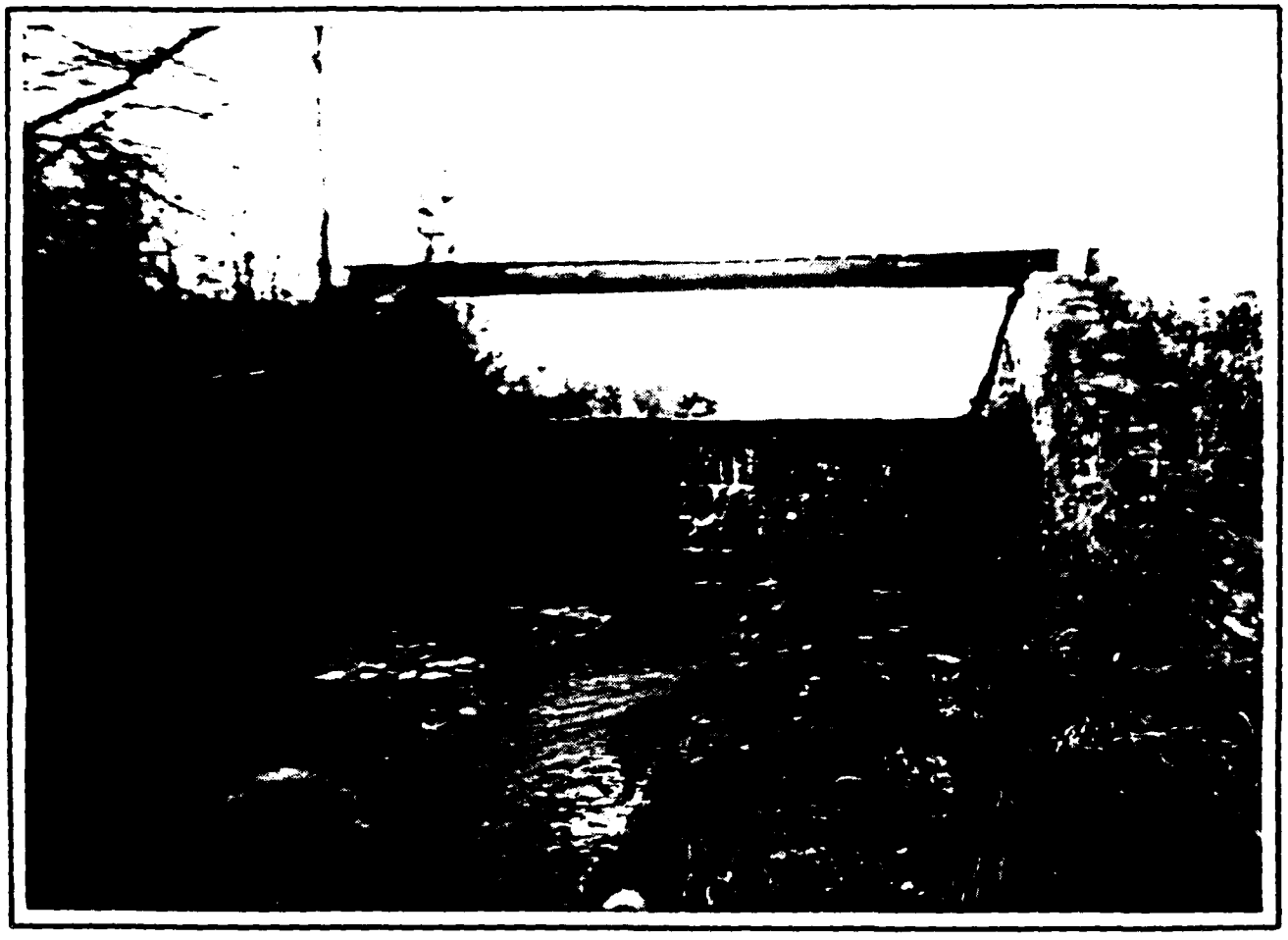
APPENDIX

C



PHOTOGRAPH LOCATION PLAN
RODEBAUGH DAM

PLATE C-1



LOOKING UPSTREAM TO SPILLWAY

PHOTOGRAPH NO. 1

VIEW ALONG CREST SHOWING TREES
ON UPSTREAM EMBANKMENT SLOPE

PHOTOGRAPH NO. 3

OVERALL VIEW OF DOWNSTREAM EMBANKMENT
AND LEFT ABUTMENT

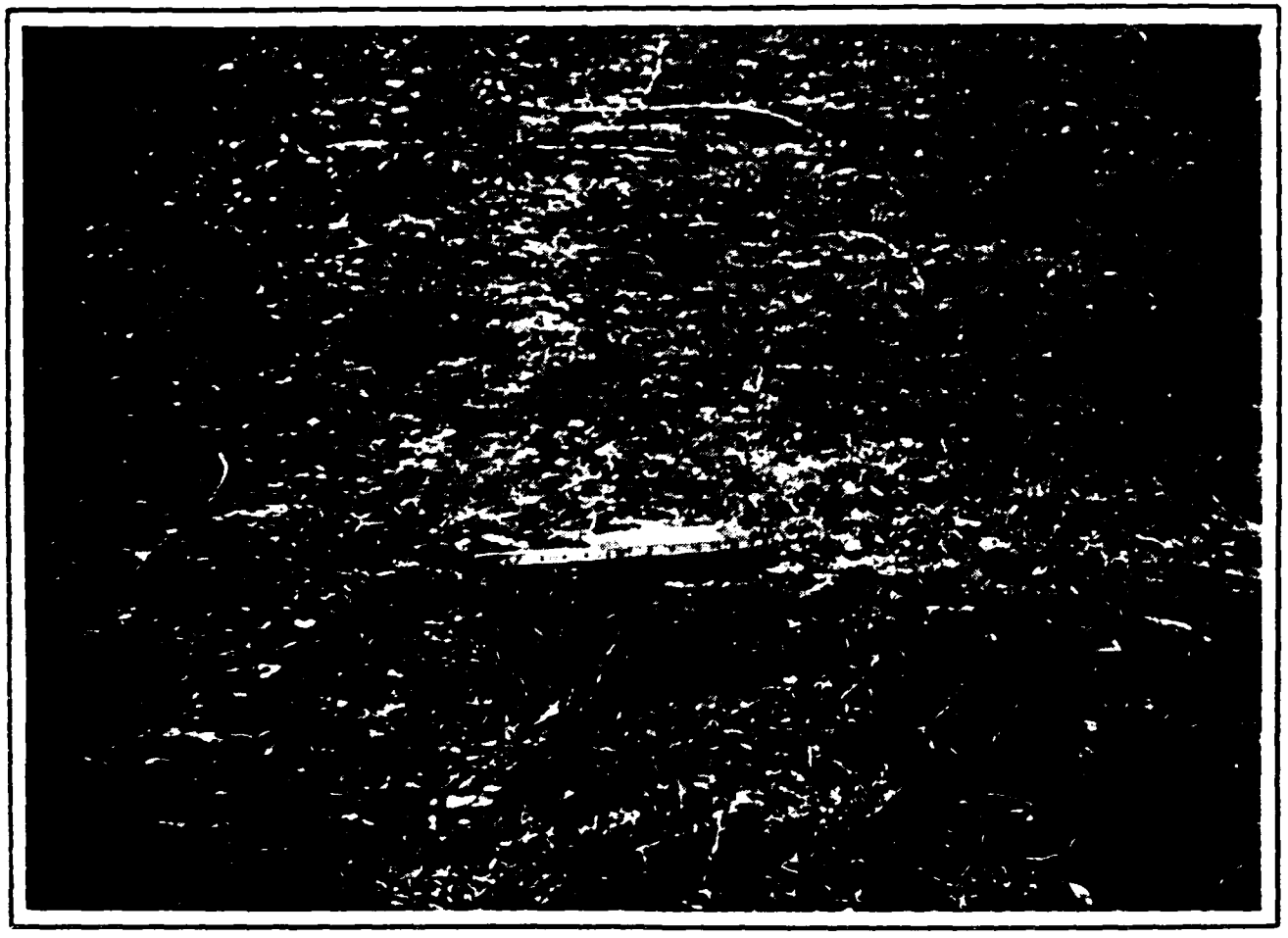
PHOTOGRAPH NO. 4

UPSTREAM EMBANKMENT AT WATER LINE

PHOTOGRAPH

TREE AT UPSTREAM WATER LINE

PHOTOGRAPH NO. 6

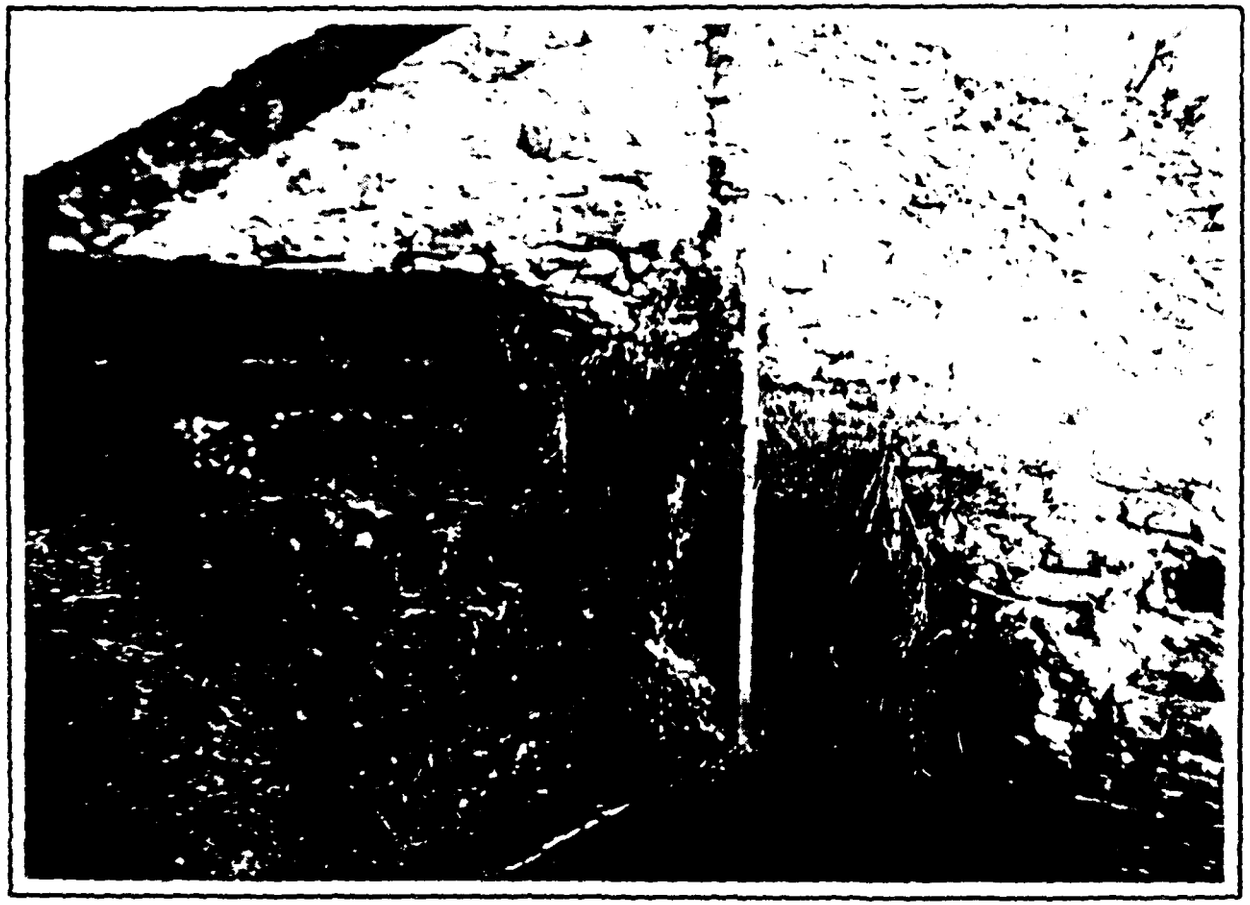


TREE ROOT ACROSS EMBANKMENT CREST ABOUT 30 FEET
AWAY FROM TREE SHOWN IN PHOTOGRAPH NO. 6

APPARENT EROSION SCARP ON DOWNSTREAM SLOPE AT MIDPOINT

PHOTOGRAPH [illegible] 9

[illegible] SPILLWAY WALL. NOTE [illegible]
OUT OF PLUMB. JOINT ON TOP OF WALL REPAIRED
MASONRY ADDED TO WALL TO CONFORM TO ORIGINAL
SPECIFICATIONS.



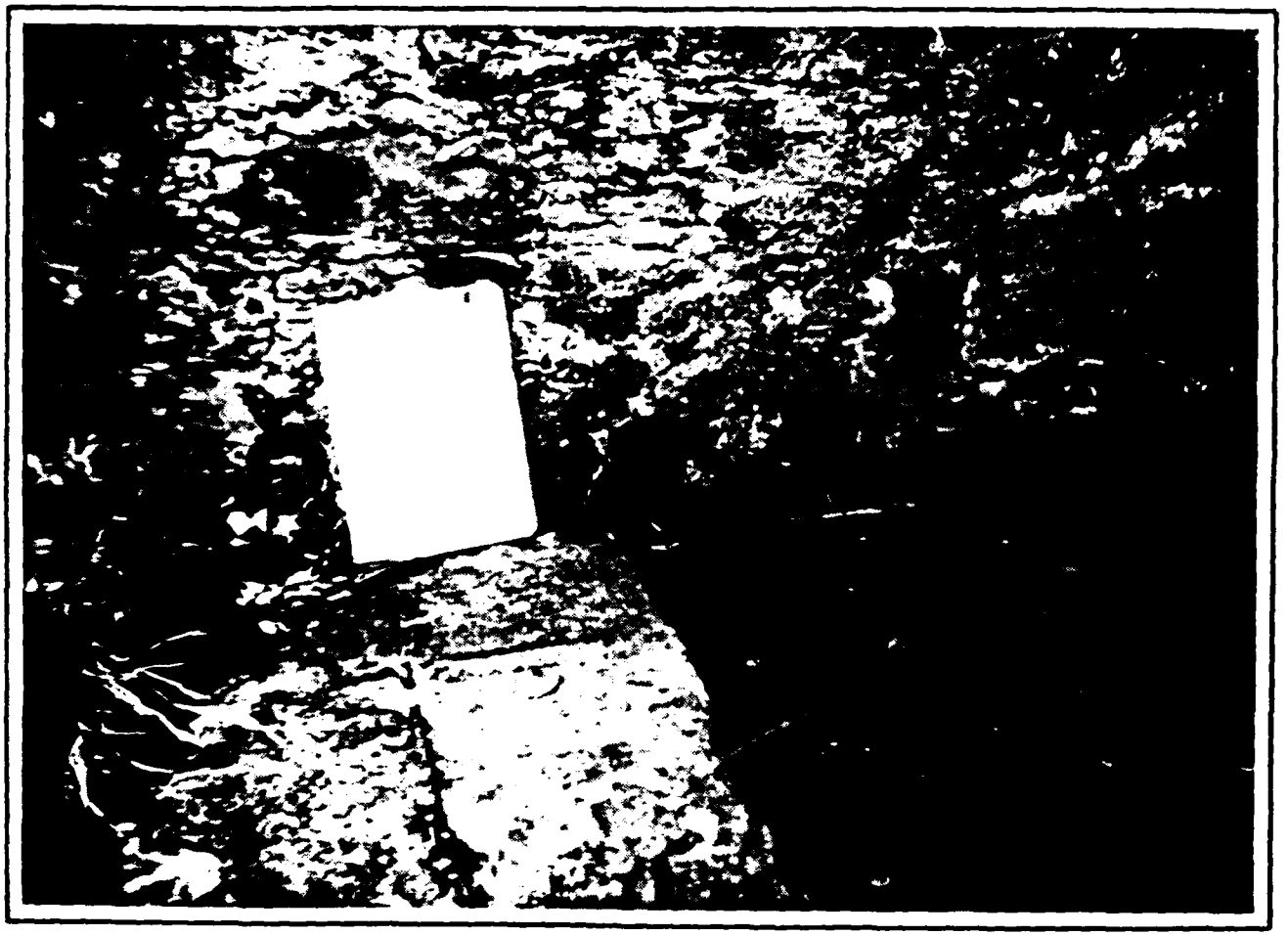
WHITE WATER TO LEFT OF STADIA ROD
IS DISCHARGE THROUGH ST. LUCAY WALL.

LOW SPILLWAY DISCHARGE FLOWS DOWN CENTER OF
SPILLWAY CHANNEL (PHOTOGRAPH NO. 1).
LARGER FLOWS FLOW THROUGH CHANNEL PAVING
VOIDS UP TO ONE FOOT DEEP AND EXIT AS
SHOWN IN PHOTOGRAPH NO. 14.

PHOTOGRAPH NO. 1

SEE PHOTOGRAPH NO.

PHOTOGRAPH NO.



DETERIORATION OF LEFT SPILLWAY WALL

PHOTOGRAPH NO. 15

FIG. [illegible] ABOUT THREE FEET [illegible] STREAM BOTTOM.

[illegible] 16

APPENDIX

D

RODEBAUGH DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *less than 50% wooded, very limited residential development.*

ELEVATION NORMAL POOL (STORAGE CAPACITY): *385.0* feet (22 Acre-feet)*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *388.6 feet (51 Acre-feet)*

ELEVATION MAXIMUM DESIGN POOL: -

ELEVATION TOP DAM: *388.6 feet*

SPILLWAY

a. Elevation *385.0 feet*

b. Type *Weir, masonry stilling basin and channel*

c. Width *20 feet*

d. Length *20 feet*

e. Location Spillover *Approximately 100 feet from right abutment*

f. Number and Type of Gates *None*

OUTLET WORKS:

a. Type *16-inch C.M.P. encased in concrete*

b. Location *Approximately 73 feet from left abutment*

c. Entrance inverts *Unknown, under water*

d. Exit inverts *372.9 feet*

e. Emergency draindown facilities *the 16-inch CMP*

HYDROMETEOROLOGICAL GAGES:

a. Type *None*

b. Location *N/A*

c. Records *N/A*

MAXIMUM NON-DAMAGING DISCHARGE: *Not Determined*

**Water surface elevation estimated as 385.0 feet from USGS map, all other elevations relative.*

BY PFM DATE 2/26/81 SUBJECT RODEBAUGH DAM HYDROLOGY / HYDRAULICS SHEET 2 OF 13

CHKD. BY DATE JOB No

HYDROLOGIC BASE DATA

DRAINAGE AREA - 0.58 SQ. MILES MEASURED FROM USGS MAP.

100 YR. EVENT RAINFALL - REF. TECHNICAL PAPER 40

30 MIN.	2.4 INCHES
1 HR.	3.2
2 HR.	3.8
3 HR.	4.2
6 HR.	5.0
12 HR.	6.1
24 HR.	7.2

SOIL CONSERVATION SERVICE HYDROGRAPH PARAMETERS

RUNOFF CURVE NUMBER	85
WATERSHED LAG	1.08

SPILLWAY CAPACITY AT MAXIMUM WATER LEVEL - 454 CFS *

* SEE SHEET 12 OF THIS APPENDIX

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quandrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputed and flows are routed downstream to the damage center and a dam breach analysis is performed. If the 100 year event is selected as the appropriate spillway design flood, the peak inflow value is correlated with other studies by adjusting hydrograph parameters.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

CLASSIFICATION (REF. RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS)

1. THE HAZARD CLASSIFICATION IS "SIGNIFICANT" AS THERE WOULD BE APPRECIABLE ECONOMIC LOSS WITH FEW LIVES LOST IN THE EVENT OF A DAM FAILURE.

2. THE SIZE CLASSIFICATION IS "SMALL" BASED ON ITS 17.2 FOOT HEIGHT AND 51 ACRE-FOOT TOTAL CAPACITY.

3. THE SELECTED SPILLWAY DESIGN FLOOD IS THE 100 YR. EVENT, BASED ON SIZE AND HAZARD CLASSIFICATION.

HYDROLOGY AND HYDRAULIC ANALYSIS

1. ORIGINAL DATA

THE DAM WAS ORIGINALLY DESIGNED WITH A 50-FOOT WIDE BY 6-FOOT DEEP SPILLWAY IN JULY OF 1936. PLANS WERE REVISED IN APRIL OF 1937 FOR A 20-FOOT WIDE BY 6-FOOT DEEP SPILLWAY. THE DAM WAS CONSTRUCTED IN THE SUMMER OF 1937 AND FINAL APPROVAL GIVEN ON AUGUST 10, 1937. SOMETIME DURING THE WINTER OF 1937-38, THE WEIR WAS RAISED 1.5 FEET. PERMISSION FOR THIS CHANGE WAS SUBMITTED ON JUNE 20, 1938 AND APPROVAL WAS GIVEN ON JUNE 22, 1938.

THE SPILLWAY CAPACITY MUST BE GREATER THAN 500 CFS, AS PER THE LETTER FROM THE STATE OF PENNSYLVANIA DATED AUGUST 13, 1936.

2. EVALUATION DATA

SPILLWAY WIDTH 20 FT.
SPILL WAY TYPE, MASONRY STILLING BASIN AND CHANNEL

MAXIMUM DISCHARGE, $Q = CLH^{3/2}$
WHERE $C = 3.32$*

* REF. HANDBOOK OF HYDRAULICS, BRATER AND KING, 1976, TABLE 5-3

WATER SURFACE	H	C	L	Q
385	0	3.32	20	0
386	1	"	"	66
387	2	"	"	188
388	3	"	"	345
388.6	3.6	"	"	454
390	5	"	"	742

RAINFALL VALUES AND SOIL CONSERVATION SERVICE HYDROGRAPH PARAMETERS ARE SHOWN ON SHEET 2. THE MAXIMUM DISCHARGE DURING A 100 YEAR EVENT IS ESTIMATED ACCORDING TO PROCEDURES CONTAINED IN DER WATER RESOURCES BULLETIN NO. 13, FLOODS IN PENNSYLVANIA.

THE SITE IS LOCATED IN FLOOD-FREQUENCY REGION 7, (PLATE 1). THE WATERSHED IS LESS THAN 15 SQ. MILES, THEREFORE

$$Q_{100} = 1110\,(A)^{0.825}$$

WHERE A = 0.58 SQ MILES FROM USGS MAP

$$= 1110(0.58)^{0.825}$$

$$Q_{100} = 708 \text{ CFS}$$

ELEVATION - STORAGE DATA

ELEVATION	SURFACE AREA (ACRES)
374.0	0
385.0	6.12
390.0	11.33
400.0	16.53

THESE AREAS WERE OBTAINED FROM THE USGS MAP AND CHECKED AGAINST AREAS DETERMINED FROM PLAN SHOWN ON PLATE 2. THESE VALUES ARE ROUNDED OFF IN THE HEC-1 PRINTOUT.

3. RESULTS OF COMPUTER ANALYSIS

THE PEAK INFLOW (Q_{100}) CALCULATED BY THE HEC-1 PROGRAM IS 710 CFS, WITHIN 0.3% OF THE VALUE COMPUTED ABOVE. THE PROGRAM INDICATES THAT THE 100 YR. EVENT WILL OVERTOP THE EMBANKMENT BY ABOUT 0.5 FEET FOR MORE THAN ONE HOUR UNDER EXISTING CONDITIONS. WITH THE EMBANKMENT CREST RAISED TO THE ELEVATION OF THE TOP OF SPILLWAY WALL, THE EMBANKMENT WOULD NOT BE OVERTOPPED DURING THE 100 YR. EVENT.

4. SPILLWAY ADEQUACY

THE SPILLWAY IS CONSIDERED "INADEQUATE" AS IT WILL NOT PASS THE SELECTED SPILLWAY DESIGN FLOOD WITHOUT OVERTOPPING THE EMBANKMENT.

MAXIMUM TAILWATER ELEVATION DURING THE SELECTED SPILLWAY DESIGN FLOOD, BASED ON THE MAXIMUM STAGE AT DOWNSTREAM STATION DS1, IS 373.4, THE STAGE JUST PRIOR TO OVERTOPPING IS ABOUT 373.1 UNDER EXISTING CONDITIONS.

```
1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********************************

 RUN  DATE= 81/02/03.
      TIME= 15.34.12.
```

RODEBAUGH DAM
NDI NO. PA 00967 DER NO. 15-273
OVERTOPPING ANALYSIS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LKOPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH - 100 YR STORM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
IN	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	.58	0.00	.58	1.00	0.000	0	1	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-85.00	0.00	0.00

CURVE NO = -85.00 WETNESS = -1.00 EFFECT CN = 85.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= 1.08

RECESSION DATA

STRTQ= -1.50 QRCSN= -.50 RTIOR= 2.00

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

0 96 Assumed Rainfall Distribution

01	.02	.02	.02	.02	.021	.021	.021	.021	.021	.021
01	.021	.021	.021	.021	.021	.021	.021	.021	.021	.021
01	.021	.021	.021	.021	.041	.041	.041	.041	.041	.041
01	.041	.041	.041	.041	.041	.041	.041	.041	.041	.041
01	.041	.041	.041	.041	.042	.042	.042	.042	.066	.066
01	.067	.067	.067	.067	.067	.068	.225	.225	.225	.225
01	.35	.35	1.25	1.25	.075	.075	.075	.075	.068	.067
01	.067	.067	.021	.021	.021	.021	.021	.021	.021	.021
01	.021	.021	.021	.021	.021	.021	.021	.021	.021	.021
01	.021	.021	.02	.02	.02	.02				

SUM	2.19	5.44	1.76	10471.
	(183.)(138.)(45.)(			296.51)

SHEET 8 OF 13

HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH - EXISTING CONDITIONS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-385.	-1

STAGE	385.00	386.00	387.00	388.00	388.60	390.00
FLOW	0.00	66.00	188.00	345.00	454.00	742.00
SURFACE AREA=	0.	6.	11.	17.		
CAPACITY=	0.	22.	65.	204.		
ELEVATION=	374.	385.	390.	400.		

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
385.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
388.6	0.0	0.0	0.

CREST LENGTH AT OR BELOW ELEVATION	0.	40.	91.	181.	218.
	388.6	388.8	388.9	389.2	389.8

PEAK OUTFLOW IS 611. AT TIME 12.25 HOURS

HYDROGRAPH ROUTING

SECTION 100 FEET DOWNSTREAM OF DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DS1	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	LSTR
0.0	0.000	0.00	1	1	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.300	0.900	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELMOT	ELMAX	RLNTH	SEL
.0550	.0550	.0550	370.9	386.7	100.	.11300

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 386.70 15.00 381.00 32.00 375.80 37.00 373.00 59.00 370.90
78.00 372.70 161.00 377.40 304.00 392.70

STORAGE	0.00	.01	.05	.12	.23	.37	.54	.76	1.00	1.27
	1.56	1.87	2.20	2.55	2.92	3.31	3.72	4.14	4.59	5.05
OUTFLOW	0.00	28.38	180.22	576.67	1290.93	2402.73	4008.12	6326.32	9295.79	13050.60
	17454.65	22522.82	28272.67	34733.30	41910.04	49818.78	58478.04	67906.67	78123.71	89148.30
STAGE	370.90	371.73	372.56	373.39	374.23	375.06	375.89	376.72	377.55	378.38
	379.22	380.05	380.88	381.71	382.54	383.37	384.21	385.04	385.87	386.70
FLOW	0.00	28.38	180.22	576.67	1290.93	2402.73	4008.12	6326.32	9295.79	13050.60
	17454.65	22522.82	28272.67	34733.30	41910.04	49818.78	58478.04	67906.67	78123.71	89148.30

MAXIMUM STAGE IS 373.4

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00
HYDROGRAPH AT	IN	.58 (1.50)	1	710. (20.09)(
ROUTED TO	OUT	.58 (1.50)	1	611. (17.31)(
ROUTED TO	DST	.58 (1.50)	1	612. (17.32)(

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	385.00	385.00	388.60
STORAGE	22.	22.	51.
OUTFLOW	0.	0.	454.

RATIO OF ~~PMF~~ 100 YR	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	389.09	.49	56.	611.	1.25	17.25	0.00

PLAN 1 STATION DS1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	612.	373.4	17.25

SHEET 12 OF 13

SUMMARY OF DAM SAFETY ANALYSIS

embankment crest raised to elevation of top of spillway wall

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	385.00	385.00	389.60
STORAGE	22.	22.	61.
OUTFLOW	0.	0.	660.

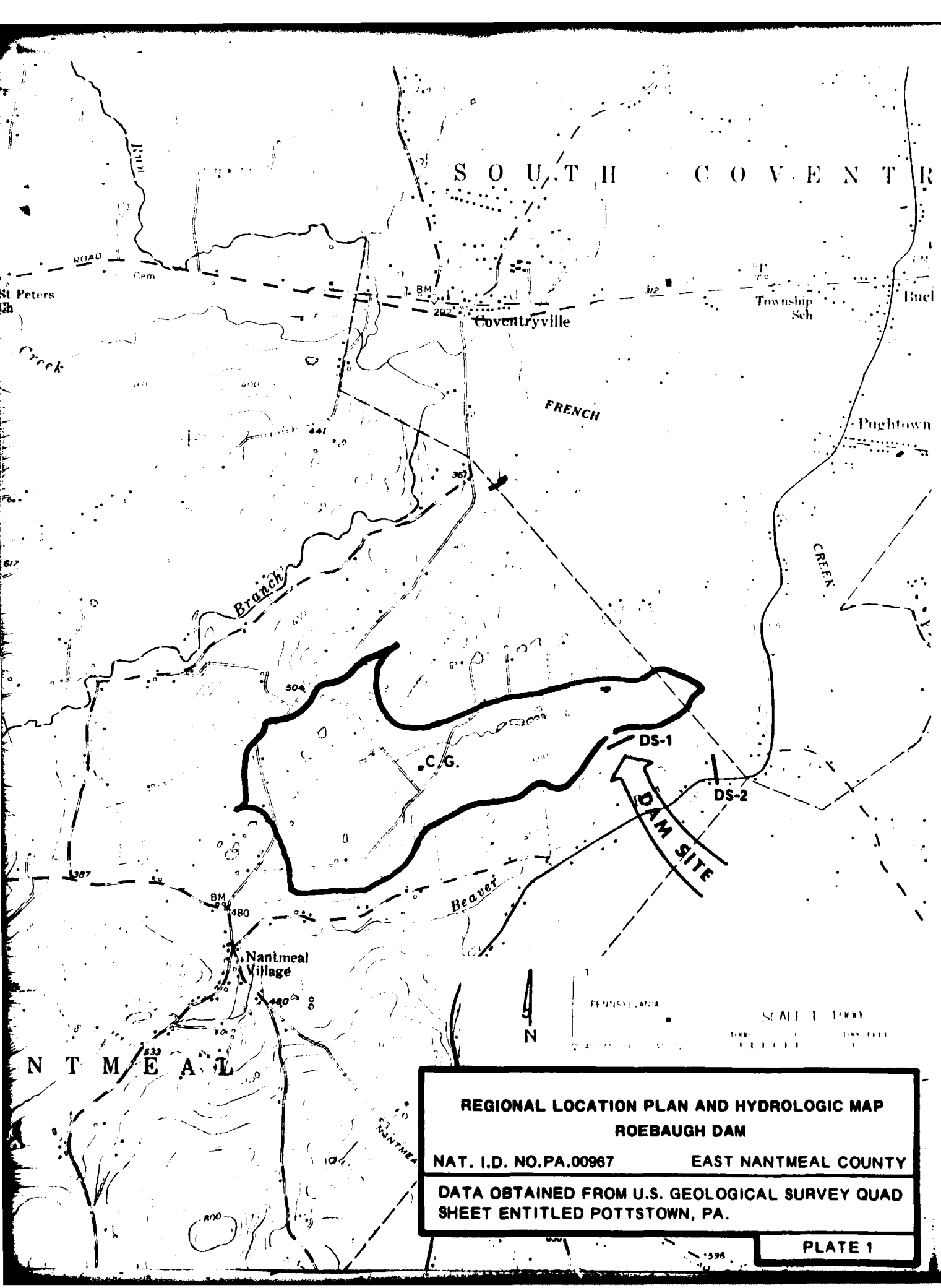
RATIO OF ~~PMF~~ 100YR	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	389.20	0.00	57.	578.	0.00	17.25	0.00

PLAN 1 STATION DSI

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	578.	373.4	17.25

APPENDIX

E

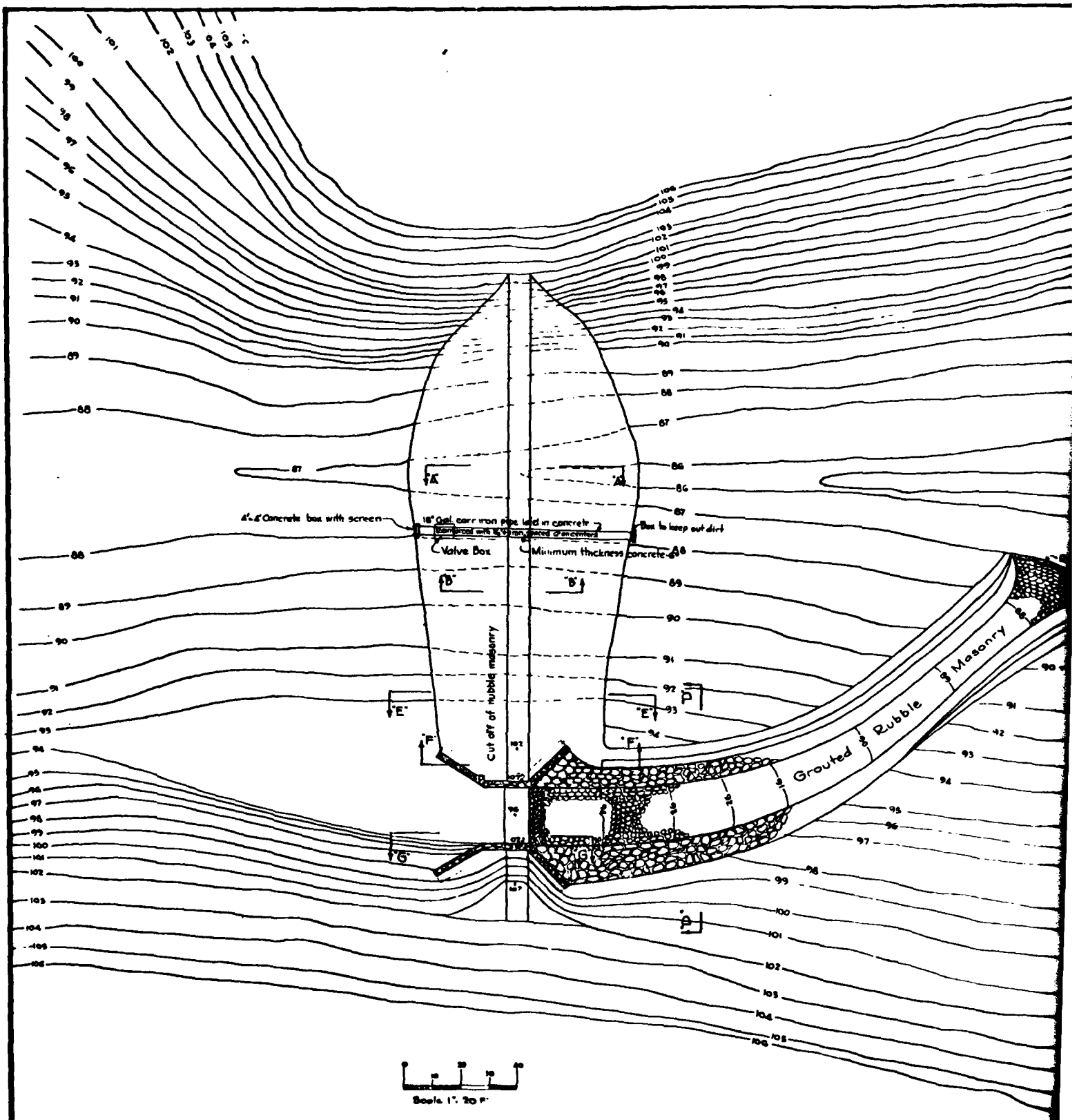


REGIONAL LOCATION PLAN AND HYDROLOGIC MAP
ROEBAUGH DAM

NAT. I.D. NO.PA.00967 **EAST NANTMEAL COUNTY**

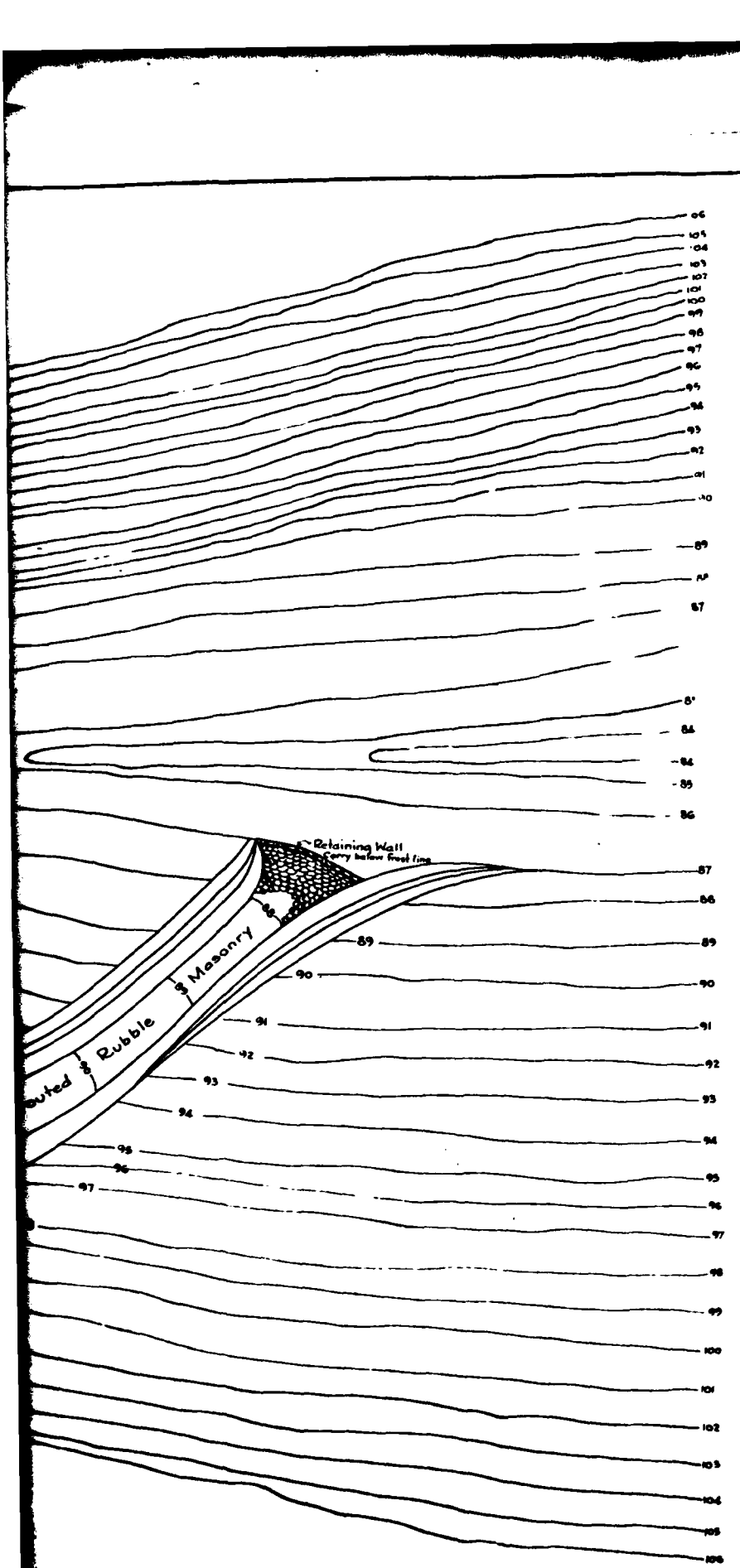
DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD SHEET ENTITLED POTTSTOWN, PA.

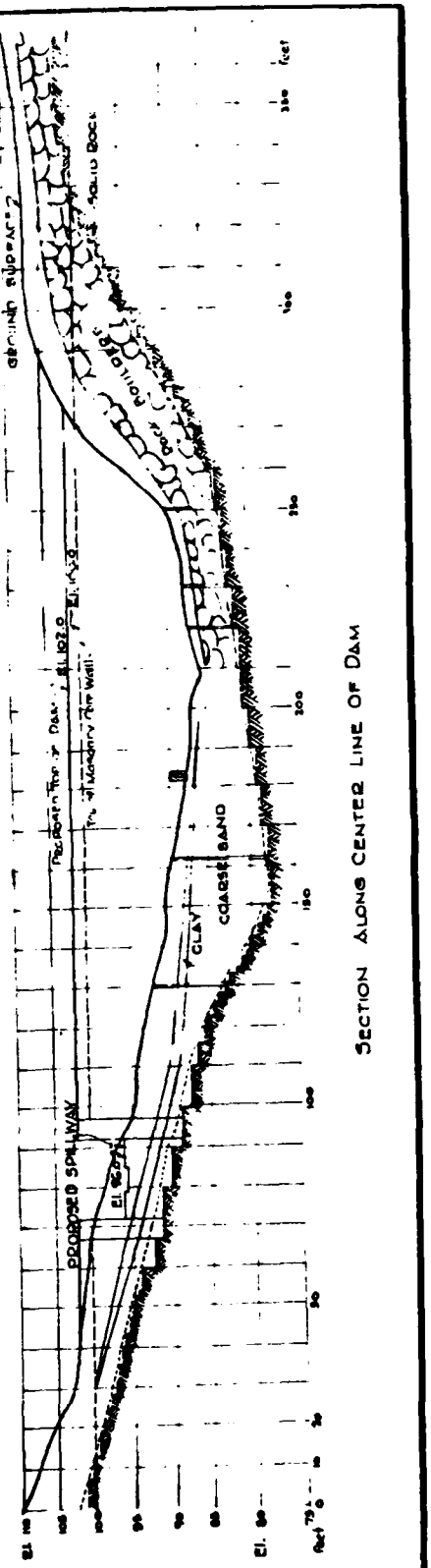
PLATE 1



PROPOSED DAM & SPILLWAY
FOR
MR & MRS. EVERITT RODEBAUGH
PUGHTOWN, PA.

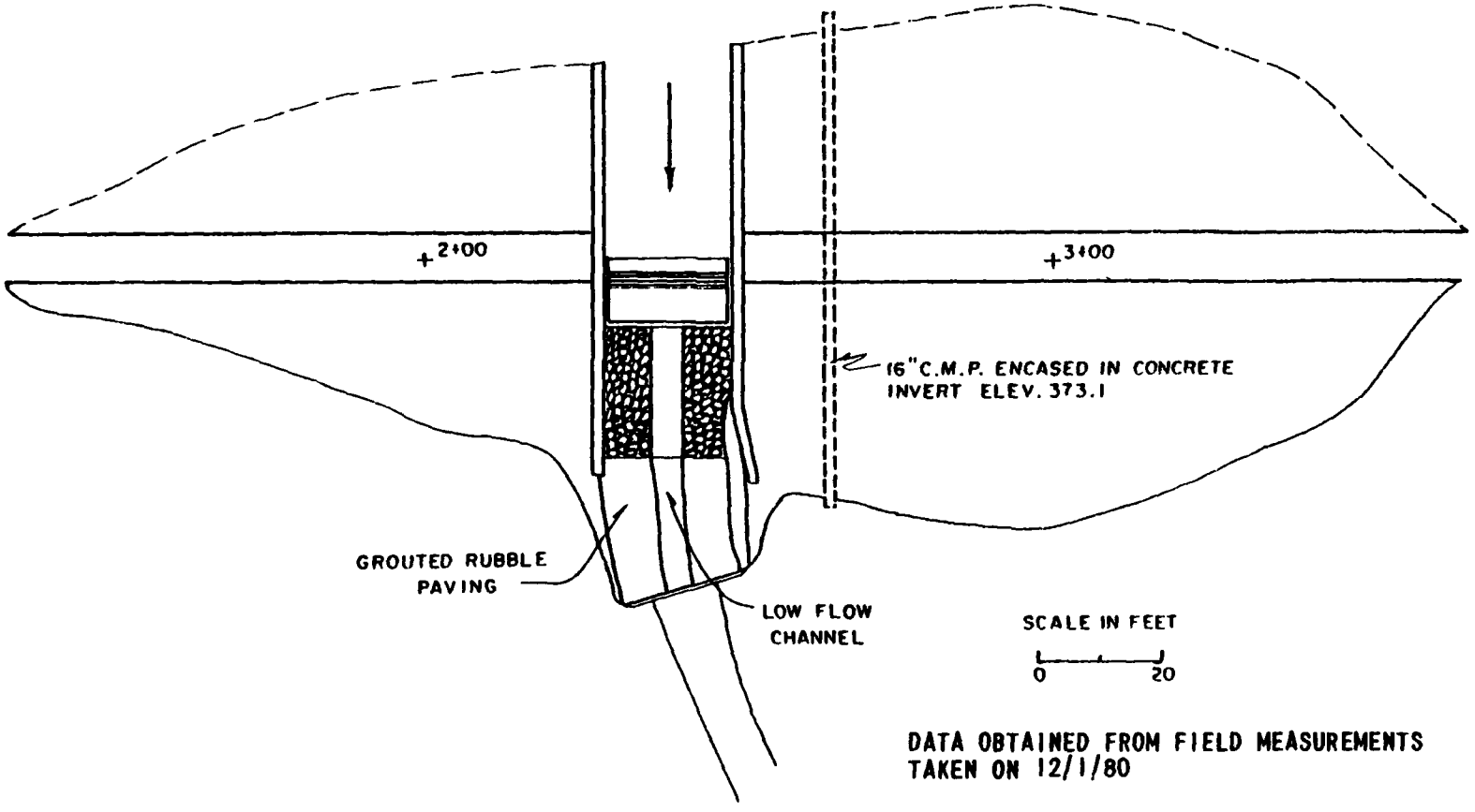
Embankment to be built in accordance with cross sections as shown on plan dated June 12, 1956





SECTION ALONG CENTER LINE OF DAM

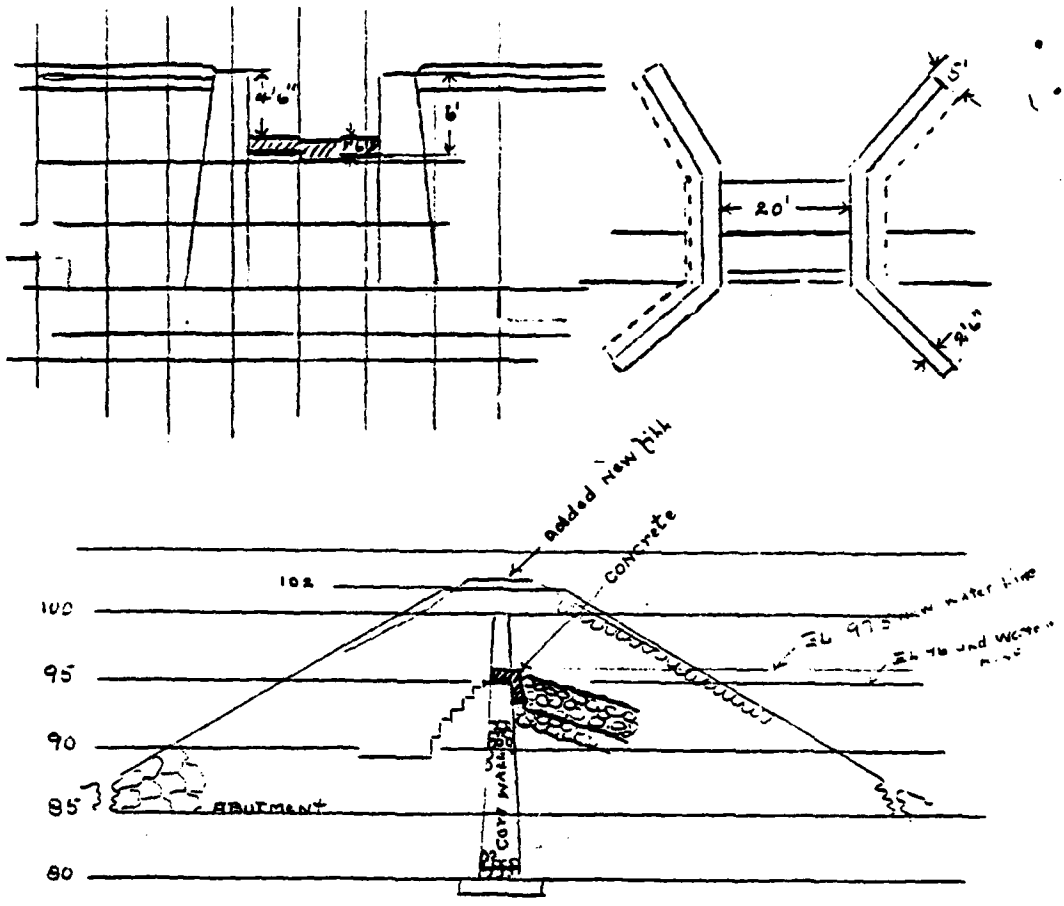
PLATE 2



DATA OBTAINED FROM FIELD MEASUREMENTS
TAKEN ON 12/1/80

PLAN VIEW
RODEBAUGH DAM

PLATE 3



Spillway in Dam of
E G Rodebaugh
Fruitdale Pa

PLATE 4

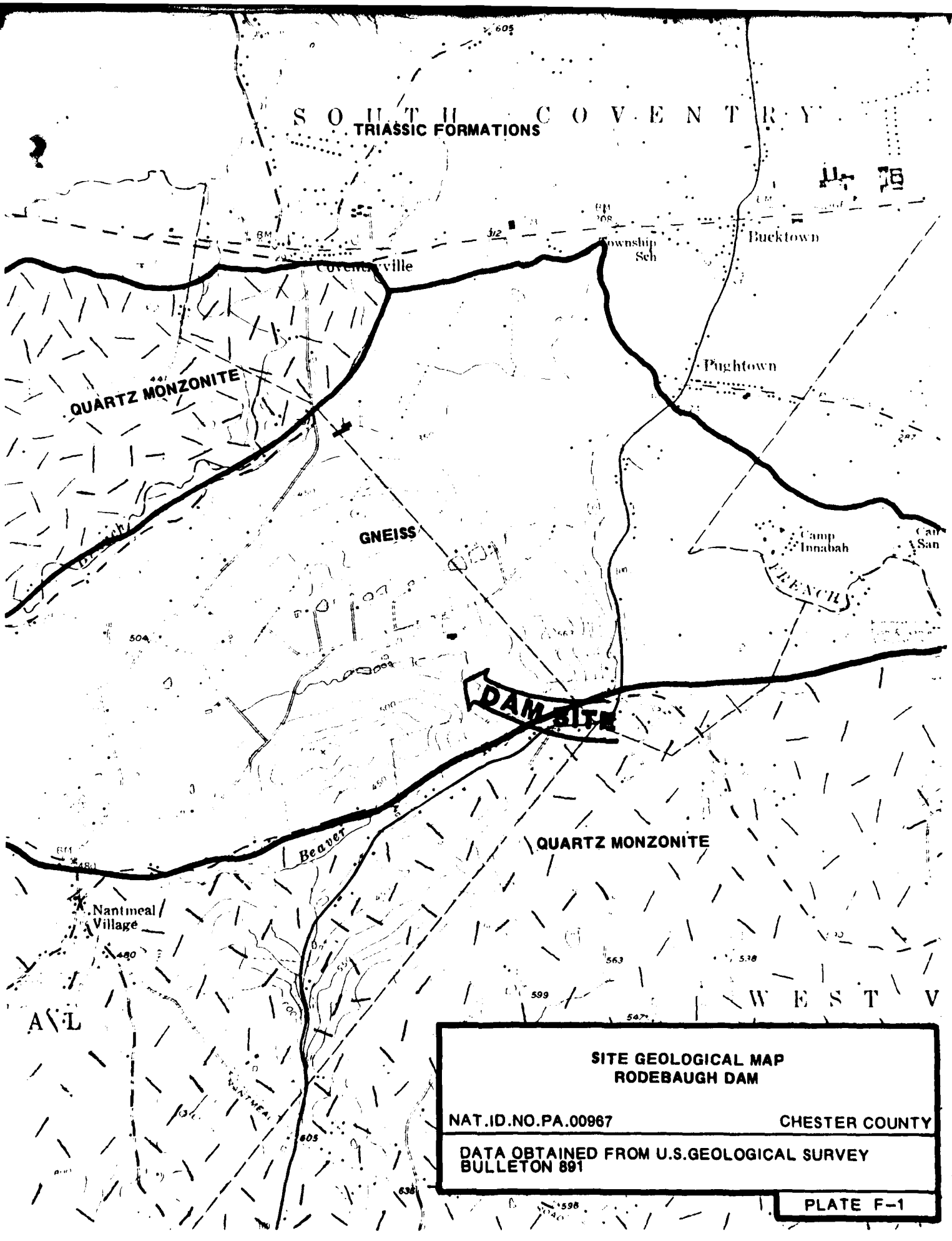
APPENDIX

F

RODEBAUGH DAM

SITE GEOLOGY

Rodebaugh Dam is located in the northern portion of the Piedmont Uplands section of the Piedmont physiographic province. As shown on Plate F-1, the bedrock underlying the dam is gneiss. No bedrock exposure were observed during the field inspection. Information contained in the state files indicates that bedrock was encountered during excavation of the core trench.

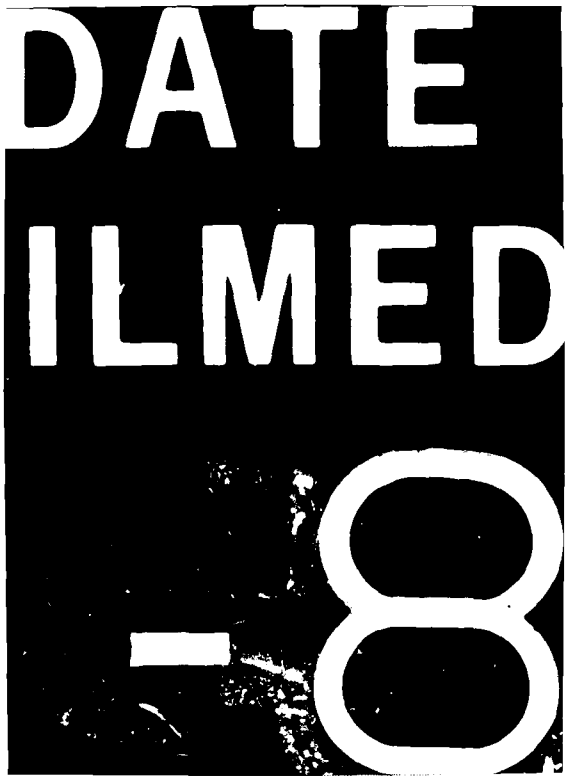


SITE GEOLOGICAL MAP
RODEBAUGH DAM

NAT.ID.NO.PA.00967 CHESTER COUNTY

DATA OBTAINED FROM U.S.GEOLOGICAL SURVEY BULLETON 891

PLATE F-1


DATE
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